



## SEQUENCE LISTING

<110> Palombella, Vito J.  
Liao, Sha-Mei

<120> MEKK1 Molecules and Uses Thereof

<130> 103576.144

<140> US 09/697,898  
<141> 2000-10-27

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<170> PatentIn version 3.0

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Val Arg Ser Val Glu Leu Asp Gln Leu Pro Glu Gln Pro Leu Phe Leu  
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Pro His Gly Ala Ala Ser Arg Gly Gly Ala His Leu Thr Glu Ser Val  
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Cys Met Pro Ala Trp Lys His Glu Trp Leu Glu Arg Arg Asn Arg Arg  
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315

320

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Asn Ser Ile Lys Asp Glu Glu Gln Met Cys Pro Ile Cys Leu Leu  
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Gly Met Leu Asp Glu Glu Ser Leu Thr Val Cys Glu Asp Gly Cys Arg  
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Asn Lys Leu His His His Cys Met Ser Ile Trp Ala Glu Glu Cys Arg  
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Ser His Asp Phe Tyr Ser His Glu Leu Ser Ser Pro Val Asp Ser Pro  
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Arg Glu Ile Leu Lys Ala Gly Ser Ile Gly Ile Gly Gly Val Asp Tyr  
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Val Leu Asn Cys Ile Leu Gly Asn Gln Thr Glu Ser Asn Asn Trp Gln  
 740                        745                        750

Glu Leu Leu Gly Arg Leu Cys Leu Ile Asp Arg Leu Leu Leu Glu Phe  
 755                        760                        765

Pro Ala Glu Phe Tyr Pro His Ile Val Ser Thr Asp Val Ser Gln Ala  
 770                        775                        780

Glu Pro Val Glu Ile Arg Tyr Lys Lys Leu Leu Ser Leu Leu Thr Phe  
 785                            790                            795                            800

Ala Leu Gln Ser Ile Asp Asn Ser His Ser Met Val Gly Lys Leu Ser  
 805                            810                            815

Arg Arg Ile Tyr Leu Ser Ser Ala Arg Met Val Thr Thr Val Pro His  
 820                            825                            830

Val Phe Ser Lys Leu Leu Glu Met Leu Ser Val Ser Ser Ser Thr His  
 835                            840                            845

Phe Thr Arg Met Arg Arg Arg Leu Met Ala Ile Ala Asp Glu Val Glu  
 850                            855                            860

Ile Ala Glu Ala Ile Gln Leu Gly Val Glu Asp Thr Leu Asp Gly Gln  
 865                            870                            875                            880

Gln Asp Ser Phe Leu Gln Ala Ser Val Pro Asn Asn Tyr Leu Glu Thr  
 885                            890                            895

Thr Glu Asn Ser Ser Pro Glu Cys Thr Val His Leu Glu Lys Thr Gly  
 900                            905                            910

Lys Gly Leu Cys Ala Thr Lys Leu Ser Ala Ser Ser Glu Asp Ile Ser  
 915                            920                            925

Glu Arg Leu Ala Ser Ile Ser Val Gly Pro Ser Ser Ser Thr Thr Thr  
 930                            935                            940

Thr Thr Thr Thr Glu Gln Pro Lys Pro Met Val Gln Thr Lys Gly  
 945                            950                            955                            960

Arg Pro His Ser Gln Cys Leu Asn Ser Ser Pro Leu Ser His His Ser  
 965                            970                            975

Gln Leu Met Phe Pro Ala Leu Ser Thr Pro Ser Ser Ser Thr Pro Ser  
 980                            985                            990

Val Pro Ala Gly Thr Ala Thr Asp Val Ser Lys His Arg Leu Gln Gly  
 995                            1000                            1005

Phe Ile Pro Cys Arg Ile Pro Ser Ala Ser Pro Gln Thr Gln Arg

1010

1015

1020

Lys Phe Ser Leu Gln Phe His Arg Asn Cys Pro Glu Asn Lys Asp  
 1025 1030 1035

Ser Asp Lys Leu Ser Pro Val Phe Thr Gln Ser Arg Pro Leu Pro  
 1040 1045 1050

Ser Ser Asn Ile His Arg Pro Lys Pro Ser Arg Pro Thr Pro Gly  
 1055 1060 1065

Asn Thr Ser Lys Gln Gly Asp Pro Ser Lys Asn Ser Met Thr Leu  
 1070 1075 1080

Asp Leu Asn Ser Ser Ser Lys Cys Asp Asp Ser Phe Gly Cys Ser  
 1085 1090 1095

Ser Asn Ser Ser Asn Ala Val Ile Pro Ser Asp Glu Thr Val Phe  
 1100 1105 1110

Thr Pro Val Glu Glu Lys Cys Arg Leu Asp Val Asn Thr Glu Leu  
 1115 1120 1125

Asn Ser Ser Ile Glu Asp Leu Leu Glu Ala Ser Met Pro Ser Ser  
 1130 1135 1140

Asp Thr Thr Val Thr Phe Lys Ser Glu Val Ala Val Leu Ser Pro  
 1145 1150 1155

Glu Lys Ala Glu Asn Asp Asp Thr Tyr Lys Asp Asp Val Asn His  
 1160 1165 1170

Asn Gln Lys Cys Lys Glu Lys Met Glu Ala Glu Glu Glu Glu Ala  
 1175 1180 1185

Leu Ala Ile Ala Met Ala Met Ser Ala Ser Gln Asp Ala Leu Pro  
 1190 1195 1200

Ile Val Pro Gln Leu Gln Val Glu Asn Gly Glu Asp Ile Ile Ile  
 1205 1210 1215

Ile Gln Gln Asp Thr Pro Glu Thr Leu Pro Gly His Thr Lys Ala  
 1220 1225 1230

Lys Gln Pro Tyr Arg Glu Asp Thr Glu Trp Leu Lys Gly Gln Gln  
 1235 1240 1245

Ile Gly Leu Gly Ala Phe Ser Ser Cys Tyr Gln Ala Gln Asp Val  
 1250 1255 1260

Gly Thr Gly Thr Leu Met Ala Val Lys Gln Val Thr Tyr Val Arg  
 1265 1270 1275

Asn Thr Ser Ser Glu Gln Glu Glu Val Val Glu Ala Leu Arg Glu  
 1280 1285 1290

Glu Ile Arg Met Met Ser His Leu Asn His Pro Asn Ile Ile Arg  
 1295 1300 1305

Met Leu Gly Ala Thr Cys Glu Lys Ser Asn Tyr Asn Leu Phe Ile  
 1310 1315 1320

Glu Trp Met Ala Gly Gly Ser Val Ala His Leu Leu Ser Lys Tyr  
 1325 1330 1335

Gly Ala Phe Lys Glu Ser Val Val Ile Asn Tyr Thr Glu Gln Leu  
 1340 1345 1350

Leu Arg Gly Leu Ser Tyr Leu His Glu Asn Gln Ile Ile His Arg  
 1355 1360 1365

Asp Val Lys Gly Ala Asn Leu Leu Ile Asp Ser Thr Gly Gln Arg  
 1370 1375 1380

Leu Arg Ile Ala Asp Phe Gly Ala Ala Ala Arg Leu Ala Ser Lys  
 1385 1390 1395

Gly Thr Gly Ala Gly Glu Phe Gln Gly Gln Leu Leu Gly Thr Ile  
 1400 1405 1410

Ala Phe Met Ala Pro Glu Val Leu Arg Gly Gln Gln Tyr Gly Arg  
 1415 1420 1425

Ser Cys Asp Val Trp Ser Val Gly Cys Ala Ile Ile Glu Met Ala  
 1430 1435 1440

Cys Ala Lys Pro Pro Trp Asn Ala Glu Lys His Ser Asn His Leu  
 1445 1450 1455

Ala Leu Ile Phe Lys Ile Ala Ser Ala Thr Thr Ala Pro Ser Ile  
 1460 1465 1470

Pro Ser His Leu Ser Pro Gly Leu Arg Asp Val Ala Leu Arg Cys  
 1475 1480 1485

Leu Glu Leu Gln Pro Gln Asp Arg Pro Pro Ser Arg Glu Leu Leu  
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Lys His Pro Val Phe Arg Thr Thr Trp  
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Arg Glu Arg Ala Asp Trp Arg Arg Arg Gln Leu Arg Lys Val Arg Ser  
 35 40 45

Val Glu Leu Asp Gln Leu Pro Glu Gln Pro Leu Phe Leu Ala Ala Ser  
 50 55 60

Pro Pro Ala Ser Ser Thr Ser Pro Ser Pro Glu Pro Ala Asp Ala Ala  
 65 70 75 80

Gly Ser Gly Thr Gly Phe Gln Pro Val Ala Val Pro Pro Pro His Gly  
 85 90 95

Ala Ala Ser Arg Arg Gly Ala His Leu Thr Glu Ser Val Ala Ala Pro  
 100 105 110

Asp Ser Gly Ala Ser Ser Pro Ala Ala Ala Glu Pro Gly Glu Lys Arg  
 115 120 125

Ala Pro Ala Ala Glu Pro Ser Pro Ala Ala Pro Ala Gly Arg Glu  
 130 135 140

Met Glu Asn Lys Glu Thr Leu Lys Gly Leu His Lys Met Asp Asp Arg  
 145 150 155 160

Pro Glu Glu Arg Met Ile Arg Glu Lys Leu Lys Ala Thr Cys Met Pro  
 165 170 175

Ala Trp Lys His Glu Trp Leu Glu Arg Arg Asn Arg Arg Gly Pro Val

180	185	190
Val Val Lys Pro Ile Pro Val Lys Gly Asp Gly Ser Glu Met Asn His		
195	200	205
Leu Ala Ala Glu Ser Pro Gly Glu Val Gln Ala Ser Ala Ala Ser Pro		
210	215	220
Ala Ser Lys Gly Arg Arg Ser Pro Ser Pro Gly Asn Ser Pro Ser Gly		
225	230	235
Arg Thr Val Lys Ser Glu Ser Pro Gly Val Arg Arg Lys Arg Val Ser		
245	250	255
Pro Val Pro Phe Gln Ser Gly Arg Ile Thr Pro Pro Arg Arg Ala Pro		
260	265	270
Ser Pro Asp Gly Phe Ser Pro Tyr Ser Pro Glu Glu Thr Asn Arg Arg		
275	280	285
Val Asn Lys Val Met Arg Ala Arg Leu Tyr Leu Leu Gln Gln Ile Gly		
290	295	300
Pro Asn Ser Phe Leu Ile Gly Gly Asp Ser Pro Asp Asn Lys Tyr Arg		
305	310	315
320		
Val Phe Ile Gly Pro Gln Asn Cys Ser Cys Ala His Gly Thr Phe Cys		
325	330	335
Ile His Leu Leu Phe Val Met Leu Arg Val Phe Gln Leu Glu Pro Ser		
340	345	350
Asp Pro Met Leu Trp Arg Lys Thr Leu Lys Asn Phe Glu Val Glu Ser		
355	360	365
Leu Phe Gln Lys Tyr His Ser Arg Arg Ser Ser Arg Ile Lys Ala Pro		
370	375	380
Ser Arg Asn Thr Ile Gln Lys Phe Val Ser Arg Met Ser Asn Ser His		
385	390	395
400		
Thr Leu Ser Ser Ser Thr Ser Thr Ser Ser Ser Glu Asn Ser Ile		
405	410	415
Lys Asp Glu Glu Glu Gln Met Cys Pro Ile Cys Leu Leu Gly Met Leu		
420	425	430
Asp Glu Glu Ser Leu Thr Val Cys Glu Asp Gly Cys Arg Asn Lys Leu		
435	440	445
His His His Cys Met Ser Ile Trp Ala Glu Glu Cys Arg Arg Asn Arg		
450	455	460
Glu Pro Leu Ile Cys Pro Leu Cys Arg Ser Lys Trp Arg Ser His Asp		
465	470	475
480		
Phe Tyr Ser His Glu Leu Ser Ser Pro Val Asp Ser Pro Ser Ser Leu		
485	490	495

Arg Ala Ala Gln Gln Gln Thr Val Gln Gln Gln Pro Leu Ala Gly Ser  
 500 505 510  
 Arg Arg Asn Gln Glu Ser Asn Phe Asn Leu Thr His Tyr Gly Thr Gln  
 515 520 525  
 Gln Ile Pro Pro Ala Tyr Lys Asp Leu Ala Glu Pro Trp Ile Gln Val  
 530 535 540  
 Phe Gly Met Glu Leu Val Gly Cys Leu Phe Ser Arg Asn Trp Asn Val  
 545 550 555 560  
 Arg Glu Met Ala Leu Arg Arg Leu Ser His Asp Val Ser Gly Ala Leu  
 565 570 575  
 Leu Leu Ala Asn Gly Glu Ser Thr Gly Asn Ser Gly Gly Ser Ser Gly  
 580 585 590  
 Ser Ser Pro Ser Gly Gly Ala Thr Ser Gly Ser Ser Gln Thr Ser Ile  
 595 600 605  
 Ser Gly Asp Val Val Glu Ala Cys Cys Ser Val Leu Ser Met Val Cys  
 610 615 620  
 Ala Asp Pro Val Tyr Lys Val Tyr Val Ala Ala Leu Lys Thr Leu Arg  
 625 630 635 640  
 Ala Met Leu Val Tyr Thr Pro Cys His Ser Leu Ala Glu Arg Ile Lys  
 645 650 655  
 Leu Gln Arg Leu Leu Gln Pro Val Val Asp Thr Ile Leu Val Lys Cys  
 660 665 670  
 Ala Asp Ala Asn Ser Arg Thr Ser Gln Leu Ser Ile Ser Thr Leu Leu  
 675 680 685  
 Glu Leu Cys Lys Gly Gln Ala Gly Glu Leu Ala Val Gly Arg Glu Ile  
 690 695 700  
 Leu Lys Ala Gly Ser Ile Gly Ile Gly Val Asp Tyr Val Leu Asn  
 705 710 715 720  
 Cys Ile Leu Gly Asn Gln Thr Glu Ser Asn Asn Trp Gln Glu Leu Leu  
 725 730 735  
 Gly Arg Leu Cys Leu Ile Asp Arg Leu Leu Leu Glu Phe Pro Ala Glu  
 740 745 750  
 Phe Tyr Pro His Ile Val Ser Thr Asp Val Ser Gln Ala Glu Pro Val  
 755 760 765  
 Glu Ile Arg Tyr Lys Lys Leu Leu Ser Leu Leu Thr Phe Ala Leu Gln  
 770 775 780  
 Ser Ile Asp Asn Ser His Ser Met Val Gly Lys Leu Ser Arg Arg Ile  
 785 790 795 800  
 Tyr Leu Ser Ser Ala Arg Met Val Thr Thr Val Pro His Val Phe Ser

805	810	815
Lys Leu Leu Glu Met Leu Ser Val Ser Ser Val Ser Thr His Phe Thr		
820	825	830
Arg Met Arg Arg Arg Leu Met Ala Tyr Ala Asp Glu Val Glu Ile Ala		
835	840	845
Glu Ala Ile Gln Leu Gly Val Glu Asp Thr Leu Gln Arg Gln Gln His		
850	855	860
Asn Ser Phe Cys Arg His Leu Phe Pro Thr Thr Ile Trp Lys Pro Gln		
865	870	875
Arg Thr Val Pro Leu Glu Cys Thr Val His Leu Glu Lys Thr Gly Lys		
885	890	895
Gly Leu Cys Ala Thr Lys Leu Ser Ala Ser Ser Glu Asp Ile Ser Glu		
900	905	910
Arg Leu Ala Arg Ile Ser Val Gly Pro Ser Ser Ser Thr Thr Thr Thr		
915	920	925
Thr Thr Thr Glu Gln Pro Lys Pro Met Val Gln Thr Lys Gly Arg		
930	935	940
Pro His Ser Gln Cys Leu Asn Ser Ser Pro Leu Ser His His Ser Gln		
945	950	955
960		
Leu Met Phe Pro Ala Leu Ser Thr Pro Ser Ser Ser Thr Pro Ser Val		
965	970	975
Pro Ala Gly Thr Ala Thr Asp Val Ser Lys His Arg Leu Gln Gly Phe		
980	985	990
Ile Pro Cys Arg Ile Pro Ser Ala Ser Pro Gln Thr Gln Arg Lys Phe		
995	1000	1005
Ser Leu Gln Phe His Arg Asn Cys Pro Glu Asn Lys Asp Ser Asp		
1010	1015	1020
Ser		
Lys Leu Ser Pro Val Phe Thr Gln Ser Arg Pro Leu Pro Ser Ser		
1025	1030	1035
Asn Ile His Arg Pro Lys Pro Ser Arg Pro Thr Pro Gly Asn Thr		
1040	1045	1050
Ser Lys Gln Gly Asp Pro Ser Lys Asn Ser Met Thr Leu Asp Leu		
1055	1060	1065
Asn Ser Ser Ser Lys Cys Asp Asp Ser Phe Gly Leu Ser Ser Asn		
1070	1075	1080
Ser Ser Asn Cys Cys Tyr Thr Ser Asp Glu Thr Val Phe Thr Pro		
1085	1090	1095
Val Glu Glu Lys Cys Arg Leu Asp Val Asn Thr Glu Leu Asn Ser		
1100	1105	1110

Ser Ile Glu Asp Leu Leu Glu Ala Ser Met Pro Ser Ser Asp Thr  
 1115 1120 1125  
 Thr Val Thr Phe Lys Ser Glu Val Ala Val Leu Ser Pro Glu Lys  
 1130 1135 1140  
 Ala Glu Asn Asp Asp Thr Tyr Lys Asp Asp Val Asn His Asn Gln  
 1145 1150 1155  
 Lys Cys Lys Glu Lys Met Glu Ala Glu Glu Glu Ala Leu Ala  
 1160 1165 1170  
 Ile Ala Met Ala Met Ser Ala Ser Gln Val Ala Leu Pro Ile Val  
 1175 1180 1185  
 Pro Gln Leu Gln Val Glu Asn Gly Glu Asp Ile Ile Ile Ile Gln  
 1190 1195 1200  
 Gln Asp Thr Pro Glu Thr Leu Pro Gly His Thr Lys Ala Lys Gln  
 1205 1210 1215  
 Pro Tyr Arg Glu Asp Thr Glu Trp Leu Lys Gly Gln Gln Ile Gly  
 1220 1225 1230  
 Leu Gly Ala Phe Ser Ser Cys Tyr Gln Ala Gln Asp Val Gly Thr  
 1235 1240 1245  
 Gly Thr Leu Met Ala Val Lys Gln Val Thr Tyr Val Arg Asn Thr  
 1250 1255 1260  
 Ser Ser Glu Gln Glu Glu Val Val Glu Ala Leu Arg Glu Glu Ile  
 1265 1270 1275  
 Arg Met Met Ser His Leu Asn His Pro Asn Ile Ile Arg Met Leu  
 1280 1285 1290  
 Gly Ala Thr Cys Glu Lys Ser Asn Tyr Asn Leu Phe Ile Glu Trp  
 1295 1300 1305  
 Met Ala Gly Gly Ser Val Ala His Leu Leu Ser Lys Tyr Gly Ala  
 1310 1315 1320  
 Phe Lys Glu Ser Val Val Ile Asn Tyr Thr Glu Gln Leu Leu Arg  
 1325 1330 1335  
 Gly Leu Ser Tyr Leu His Glu Asn Gln Ile Ile His Arg Asp Val  
 1340 1345 1350  
 Lys Gly Ala Asn Leu Leu Ile Asp Ser Thr Gly Gln Arg Leu Arg  
 1355 1360 1365  
 Ile Ala Asp Phe Gly Ala Ala Ala Arg Leu Ala Ser Lys Gly Thr  
 1370 1375 1380  
 Gly Ala Gly Glu Phe Gln Gly Gln Leu Leu Gly Thr Ile Ala Phe  
 1385 1390 1395  
 Met Ala Pro Glu Val Leu Arg Gly Gln Gln Tyr Gly Arg Ser Cys

1400	1405	1410
Asp Val Trp Ser Val Gly Cys Ala Ile Ile Glu Met Ala Cys Ala		
1415	1420	1425
Lys Pro Pro Trp Asn Ala Glu Lys His Ser Asn His Leu Ala Leu		
1430	1435	1440
Ile Phe Lys Ile Ala Ser Ala Thr Thr Ala Pro Ser Ile Pro Ser		
1445	1450	1455
His Leu Ser Pro Gly Leu Arg Asp Val Ala Leu Arg Cys Leu Glu		
1460	1465	1470
Leu Gln Pro Gln Asp Arg Pro Pro Ser Arg Glu Leu Leu Lys His		
1475	1480	1485
Pro Val Phe Arg Thr Thr Trp		
1490	1495	
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20	25	30
Gly Ser Gly Ala Pro Ala Ala Gly Ala Gly Leu Leu Arg Glu Thr Gly		
35	40	45
Ser Ala Gly Arg Glu Arg Ala Asp Trp Arg Arg Gln Gln Leu Arg Lys		
50	55	60
Val Arg Ser Val Glu Leu Asp Gln Leu Pro Glu Gln Pro Leu Phe Leu		
65	70	75
		80
Thr Ala Ser Pro Pro Cys Pro Ser Thr Ser Pro Ser Pro Glu Pro Ala		
85	90	95
Asp Ala Ala Ala Gly Ala Ser Gly Phe Gln Pro Ala Ala Gly Pro Pro		
100	105	110
Pro Pro Gly Ala Ala Ser Arg Cys Gly Ser His Ser Ala Glu Leu Ala		
115	120	125
Ala Ala Arg Asp Ser Gly Ala Arg Ser Pro Ala Gly Ala Glu Pro Pro		
130	135	140
Ser Ala Ala Ala Pro Ser Gly Arg Glu Met Glu Asn Lys Glu Thr Leu		
145	150	155
		160
Lys Gly Leu His Lys Met Asp Asp Arg Pro Glu Glu Arg Met Ile Arg		

165	170	175
Glu Lys Leu Lys Ala Thr Cys Met Pro Ala Trp Lys His Glu Trp Leu		
180	185	190
Glu Arg Arg Asn Arg Arg Gly Pro Val Val Val Lys Pro Ile Pro Ile		
195	200	205
Lys Gly Asp Gly Ser Glu Met Ser Asn Leu Ala Ala Glu Leu Gln Gly		
210	215	220
Glu Gly Gln Ala Gly Ser Ala Ala Pro Ala Pro Lys Gly Arg Arg Ser		
225	230	240
Pro Ser Pro Gly Ser Ser Pro Ser Gly Arg Ser Gly Lys Pro Glu Ser		
245	250	255
Pro Gly Val Arg Arg Lys Arg Val Ser Pro Val Pro Phe Gln Ser Gly		
260	265	270
Arg Ile Thr Pro Pro Arg Arg Ala Pro Ser Pro Asp Gly Phe Ser Pro		
275	280	285
Ser Pro Glu Glu Thr Ser Arg Arg Val Asn Lys Val Met Arg Ala Arg		
290	295	300
Leu Tyr Leu Leu Gln Gln Ile Gly Pro Asn Ser Phe Leu Ile Gly Gly		
305	310	320
Asp Ser Pro Asp Asn Lys Tyr Arg Val Phe Ile Gly Pro Gln Asn Cys		
325	330	335
Ser Cys Gly Arg Gly Thr Phe Cys Ile His Leu Leu Phe Val Met Leu		
340	345	350
Arg Val Phe Gln Leu Glu Pro Ser Asp Pro Met Leu Trp Arg Lys Thr		
355	360	365
Leu Lys Asn Phe Glu Val Glu Ser Leu Phe Gln Lys Tyr His Ser Arg		
370	375	380
Arg Ser Ser Arg Ile Lys Ala Pro Ser Arg Asn Thr Ile Gln Lys Phe		
385	390	400
Val Ser Arg Met Ser Asn Cys His Thr Leu Ser Ser Ser Thr Ser		
405	410	415
Thr Ser Ser Ser Glu Asn Ser Ile Lys Asp Glu Glu Glu Gln Met Cys		
420	425	430
Pro Ile Cys Leu Leu Gly Met Leu Asp Glu Glu Ser Leu Thr Val Cys		
435	440	445
Glu Asp Gly Cys Arg Asn Lys Leu His His His Cys Met Ser Ile Trp		
450	455	460
Ala Glu Glu Cys Arg Arg Asn Arg Glu Pro Leu Ile Cys Pro Leu Cys		
465	470	475
		480

Arg Ser Lys Trp Arg Ser His Asp Phe Tyr Ser His Glu Leu Ser Ser  
 485 490 495  
 Pro Val Asp Ser Pro Thr Ser Leu Arg Gly Val Gln Gln Pro Ser Ser  
 500 505 510  
 Pro Gln Gln Pro Val Ala Gly Ser Gln Arg Arg Asn Gln Glu Ser Asn  
 515 520 525  
 Phe Asn Leu Thr His Tyr Gly Thr Gln Gln Ile Pro Pro Ala Tyr Lys  
 530 535 540  
 Asp Leu Ala Glu Pro Trp Ile Gln Ala Phe Gly Met Glu Leu Val Gly  
 545 550 555 560  
 Cys Leu Phe Ser Arg Asn Trp Asn Val Arg Glu Met Ala Leu Arg Arg  
 565 570 575  
 Leu Ser His Asp Val Ser Gly Ala Leu Leu Leu Ala Asn Gly Glu Ser  
 580 585 590  
 Thr Gly Thr Ser Gly Gly Ser Gly Ser Leu Ser Ala Gly Ala  
 595 600 605  
 Ala Ser Gly Ser Ser Gln Pro Ser Ile Ser Gly Asp Val Val Glu Ala  
 610 615 620  
 Phe Cys Ser Val Leu Ser Ile Val Cys Ala Asp Pro Val Tyr Lys Val  
 625 630 635 640  
 Tyr Val Ala Ala Leu Lys Thr Leu Arg Ala Met Leu Val Tyr Thr Pro  
 645 650 655  
 Cys His Ser Leu Ala Glu Arg Ile Lys Leu Gln Arg Leu Leu Arg Pro  
 660 665 670  
 Val Val Asp Thr Ile Leu Val Lys Cys Ala Asp Ala Asn Ser Arg Thr  
 675 680 685  
 Ser Gln Leu Ser Ile Ser Thr Leu Leu Glu Leu Cys Lys Gly Gln Ala  
 690 695 700  
 Gly Glu Leu Ala Val Gly Arg Glu Ile Leu Lys Ala Gly Ser Ile Gly  
 705 710 715 720  
 Val Gly Gly Val Asp Tyr Val Leu Ser Cys Ile Leu Gly Asn Gln Ala  
 725 730 735  
 Glu Ser Asn Asn Trp Gln Glu Leu Leu Gly Arg Leu Cys Leu Ile Asp  
 740 745 750  
 Arg Leu Leu Leu Glu Ile Ser Ala Glu Phe Tyr Pro His Ile Val Ser  
 755 760 765  
 Thr Asp Val Ser Gln Ala Glu Pro Val Glu Ile Arg Tyr Lys Lys Leu  
 770 775 780  
 Leu Ser Leu Leu Ala Phe Ala Leu Gln Ser Ile Asp Asn Ser His Ser

785	790	795	800
Met Val Gly Lys Leu Ser Arg Arg Ile Tyr Leu Ser Ser Ala Arg Met			
805		810	815
Val Thr Thr Val Pro Pro Leu Phe Ser Lys Leu Val Thr Met Leu Ser			
820		825	830
Ala Ser Gly Ser Ser His Phe Ala Arg Met Arg Arg Arg Leu Met Ala			
835		840	845
Ile Ala Asp Glu Val Glu Ile Ala Glu Val Ile Gln Leu Gly Ser Glu			
850		855	860
Asp Thr Leu Asp Gly Gln Gln Asp Ser Ser Gln Ala Leu Ala Pro Pro			
865		870	875
Arg Tyr Pro Glu Ser Ser Ser Leu Glu His Thr Ala His Val Glu Lys			
885		890	895
Thr Gly Lys Gly Leu Lys Ala Thr Arg Leu Ser Ala Ser Ser Glu Asp			
900		905	910
Ile Ser Asp Arg Leu Ala Gly Val Ser Val Gly Leu Pro Ser Ser Ala			
915		920	925
Thr Thr Glu Gln Pro Lys Pro Thr Val Gln Thr Lys Gly Arg Pro His			
930		935	940
Ser Gln Cys Leu Asn Ser Ser Pro Leu Ser Pro Pro Gln Leu Met Phe			
945		950	955
960			
Pro Ala Ile Ser Ala Pro Cys Ser Ser Ala Pro Ser Val Pro Ala Gly			
965		970	975
Ser Val Thr Asp Ala Ser Lys His Arg Pro Arg Ala Phe Val Pro Cys			
980		985	990
Lys Ile Pro Ser Ala Ser Pro Gln Thr Gln Arg Lys Phe Ser Leu Gln			
995		1000	1005
Phe Gln Arg Thr Cys Ser Glu Asn Arg Asp Ser Glu Lys Leu Ser			
1010		1015	1020
Pro Val Phe Thr Gln Ser Arg Pro Pro Pro Ser Ser Asn Ile His			
1025		1030	1035
Arg Ala Lys Ala Ser Arg Pro Val Pro Gly Ser Thr Ser Lys Leu			
1040		1045	1050
Gly Asp Ala Ser Lys Asn Ser Met Thr Leu Asp Leu Asn Ser Ala			
1055		1060	1065
Ser Gln Cys Asp Asp Ser Phe Gly Ser Gly Ser Asn Ser Gly Ser			
1070		1075	1080
Ala Val Ile Pro Ser Glu Glu Thr Ala Phe Thr Pro Ala Glu Asp			
1085		1090	1095

Lys Cys Arg Leu Asp Val Asn Pro Glu Leu Asn Ser Ser Ile Glu  
 1100 1105 1110  
 Asp Leu Leu Glu Ala Ser Met Pro Ser Ser Asp Thr Thr Val Thr  
 1115 1120 1125  
 Phe Lys Ser Glu Val Ala Val Leu Ser Pro Glu Lys Ala Glu Ser  
 1130 1135 1140  
 Asp Asp Thr Tyr Lys Asp Asp Val Asn His Asn Gln Lys Cys Lys  
 1145 1150 1155  
 Glu Lys Met Glu Ala Glu Glu Glu Glu Ala Leu Ala Ile Ala Met  
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 Ala Met Ser Ala Ser Gln Asp Ala Leu Pro Ile Val Pro Gln Leu  
 1175 1180 1185  
 Gln Val Glu Asn Gly Glu Asp Ile Ile Ile Ile Gln Gln Asp Thr  
 1190 1195 1200  
 Pro Glu Thr Leu Pro Gly His Thr Lys Ala Asn Glu Pro Tyr Arg  
 1205 1210 1215  
 Glu Asp Thr Glu Trp Leu Lys Gly Gln Gln Ile Gly Leu Gly Ala  
 1220 1225 1230  
 Phe Ser Ser Cys Tyr Gln Ala Gln Asp Val Gly Thr Gly Thr Leu  
 1235 1240 1245  
 Met Ala Val Lys Gln Val Thr Tyr Val Arg Asn Thr Ser Ser Glu  
 1250 1255 1260  
 Gln Glu Glu Val Val Glu Ala Leu Arg Glu Glu Ile Arg Met Met  
 1265 1270 1275  
 Ser His Leu Asn His Pro Asn Ile Ile Arg Met Leu Gly Ala Thr  
 1280 1285 1290  
 Cys Glu Lys Ser Asn Tyr Asn Leu Phe Ile Glu Trp Met Ala Gly  
 1295 1300 1305  
 Ala Ser Val Ala His Leu Leu Ser Lys Tyr Gly Ala Phe Lys Glu  
 1310 1315 1320  
 Ser Val Val Ile Asn Tyr Thr Glu Gln Leu Leu Arg Gly Leu Ser  
 1325 1330 1335  
 Tyr Leu His Glu Asn Gln Ile Ile His Arg Asp Val Lys Gly Ala  
 1340 1345 1350  
 Asn Leu Leu Ile Asp Ser Thr Gly Gln Arg Leu Arg Ile Ala Asp  
 1355 1360 1365  
 Phe Gly Ala Ala Ala Arg Leu Ala Ser Lys Gly Thr Gly Ala Gly  
 1370 1375 1380  
 Glu Phe Gln Gly Gln Leu Leu Gly Thr Ile Ala Phe Met Ala Pro

1385	1390	1395
Glu Val Leu Arg Gly Gln Gln	Tyr Gly Arg Ser Cys Asp Val Trp	
1400	1405	1410
Ser Val Gly Cys Ala Ile Ile	Glu Met Ala Cys Ala Lys Pro Pro	
1415	1420	1425
Trp Asn Ala Glu Lys His Ser Asn His Leu Ala Leu Ile Phe Lys		
1430	1435	1440
Ile Ala Ser Ala Thr Thr Ala Pro Ser Ile Pro Ser His Leu Ser		
1445	1450	1455
Pro Gly Leu Arg Asp Val Ala Leu Arg Cys Leu Glu Leu Gln Pro		
1460	1465	1470
Gln Asp Arg Pro Pro Ser Arg Glu Leu Leu Lys His Pro Val Phe		
1475	1480	1485
Arg Thr Thr Trp		
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20	25	30
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35	40	45
Arg Glu Pro Gly Ser Ala Gly Arg Glu Arg Ala Asp Trp Arg Arg Arg		
50	55	60
Gln Leu Arg Lys Val Arg Ser Val Glu Leu Asp Gln Leu Pro Glu Gln		
65	70	75
		80
Pro Leu Phe Leu Ala Ala Ala Ser Pro Pro Cys Pro Ser Thr Ser Pro		
85	90	95
Ser Pro Glu Pro Ala Asp Ala Ala Gly Ala Ser Arg Phe Gln Pro		
100	105	110
Ala Ala Gly Pro Pro Pro Gly Ala Ala Ser Arg Cys Gly Ser His		
115	120	125
Ser Ala Glu Leu Ala Ala Ala Arg Asp Ser Gly Ala Arg Ser Pro Ala		
130	135	140
Gly Ala Glu Pro Pro Ser Ala Ala Pro Ser Gly Arg Glu Met Glu		

145	150	155	160
Asn Lys Glu Thr Leu Lys Gly Leu His Lys Met Glu Asp Arg Pro Glu			
165	170	175	
Glu Arg Met Ile Arg Glu Lys Leu Lys Ala Thr Cys Met Pro Ala Trp			
180	185	190	
Lys His Glu Trp Leu Glu Arg Arg Asn Arg Arg Gly Pro Val Val Val			
195	200	205	
Lys Pro Ile Pro Ile Lys Gly Asp Gly Ser Glu Val Asn Asn Leu Ala			
210	215	220	
Ala Glu Pro Gln Gly Glu Gly Gln Ala Gly Ser Ala Ala Pro Ala Pro			
225	230	235	240
Lys Gly Arg Arg Ser Pro Ser Pro Gly Ser Ser Pro Ser Gly Arg Ser			
245	250	255	
Val Lys Pro Glu Ser Pro Gly Val Arg Arg Lys Arg Val Ser Pro Val			
260	265	270	
Pro Phe Gln Ser Gly Arg Ile Thr Pro Pro Arg Arg Ala Pro Ser Pro			
275	280	285	
Asp Gly Phe Ser Pro Tyr Ser Pro Glu Glu Thr Ser Arg Arg Val Asn			
290	295	300	
Lys Val Met Arg Ala Arg Leu Tyr Leu Leu Gln Gln Ile Gly Pro Asn			
305	310	315	320
Ser Phe Leu Ile Gly Gly Asp Ser Pro Asp Asn Lys Tyr Arg Val Phe			
325	330	335	
Ile Gly Pro Gln Asn Cys Ser Cys Gly Arg Gly Ala Phe Cys Ile His			
340	345	350	
Leu Leu Phe Val Met Leu Arg Val Phe Gln Leu Glu Pro Ser Asp Pro			
355	360	365	
Met Leu Trp Arg Lys Thr Leu Lys Asn Phe Glu Val Glu Ser Leu Phe			
370	375	380	
Gln Lys Tyr His Ser Arg Arg Ser Ser Arg Ile Lys Ala Pro Ser Arg			
385	390	395	400
Asn Thr Ile Gln Lys Phe Val Ser Arg Met Ser Asn Ser His Thr Leu			
405	410	415	
Ser Ser Ser Ser Thr Ser Thr Ser Ser Glu Asn Ser Ile Lys Asp			
420	425	430	
Glu Glu Glu Gln Met Cys Pro Ile Cys Leu Leu Gly Met Leu Asp Glu			
435	440	445	
Glu Ser Leu Thr Val Cys Glu Asp Gly Cys Arg Asn Lys Leu His His			
450	455	460	

His Cys Met Ser Ile Trp Ala Glu Glu Cys Arg Arg Asn Arg Glu Pro  
 465 470 475 480  
 Leu Ile Cys Pro Leu Cys Arg Ser Trp Arg Ser His Asp Phe Tyr Ser  
 485 490 495  
 His Glu Leu Ser Ser Pro Val Glu Ser Pro Ala Ser Leu Arg Ala Val  
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 515 520 525  
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 530 535 540  
 Pro Ser Ala Tyr Lys Asp Leu Ala Glu Pro Trp Ile Gln Val Phe Gly  
 545 550 555 560  
 Met Glu Leu Val Gly Cys Leu Phe Ser Arg Asn Trp Asn Val Arg Glu  
 565 570 575  
 Met Ala Leu Arg Arg Leu Ser His Asp Val Ser Gly Ala Leu Leu Leu  
 580 585 590  
 Ala Asn Gly Glu Ser Thr Gly Asn Ser Gly Gly Ser Gly Gly Ser  
 595 600 605  
 Leu Ser Ala Gly Ala Ala Ser Gly Ser Ser Gln Pro Ser Ile Ser Gly  
 610 615 620  
 Asp Val Val Glu Ala Cys Cys Ser Val Leu Ser Ile Val Cys Ala Asp  
 625 630 635 640  
 Pro Val Tyr Lys Val Tyr Val Ala Ala Leu Lys Thr Leu Arg Ala Met  
 645 650 655  
 Leu Val Tyr Thr Pro Cys His Ser Leu Ala Glu Arg Ile Lys Leu Gln  
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 Arg Leu Leu Arg Pro Val Val Asp Thr Ile Leu Val Lys Cys Ala Asp  
 675 680 685  
 Ala Asn Ser Arg Thr Ser Gln Leu Ser Ile Ser Thr Val Leu Glu Leu  
 690 695 700  
 Cys Lys Gly Gln Ala Gly Glu Leu Ala Val Gly Arg Glu Ile Leu Lys  
 705 710 715 720  
 Ala Gly Ser Ile Gly Val Gly Val Asp Tyr Val Leu Ser Cys Ile  
 725 730 735  
 Leu Gly Asn Gln Ala Glu Ser Asn Asn Trp Gln Glu Leu Leu Gly Arg  
 740 745 750  
 Leu Cys Leu Ile Asp Arg Leu Leu Leu Glu Phe Pro Ala Glu Phe Tyr  
 755 760 765  
 Pro His Ile Val Ser Thr Asp Val Ser Gln Ala Glu Pro Val Glu Ile

770	775	780
Arg Tyr Lys Lys Leu Leu Ser Leu Leu Thr Phe Ala Leu Gln Ser Ile		
785	790	795
Asp Asn Ser His Ser Met Val Gly Lys Leu Ser Arg Arg Ile Tyr Leu		
805	810	815
Ser Ser Ala Arg Met Val Thr Ala Val Pro Ala Val Phe Ser Lys Leu		
820	825	830
Val Thr Met Leu Asn Ala Ser Gly Ser Thr His Phe Thr Arg Met Arg		
835	840	845
Arg Arg Leu Met Ala Ile Ala Asp Glu Val Glu Ile Ala Glu Val Ile		
850	855	860
Gln Leu Gly Val Glu Asp Thr Val Asp Gly His Gln Asp Ser Leu Gln		
865	870	875
Ala Val Ala Pro Thr Ser Cys Leu Glu Asn Ser Ser Leu Glu His Thr		
885	890	895
Val His Arg Glu Lys Thr Gly Lys Gly Leu Ser Ala Thr Arg Leu Ser		
900	905	910
Ala Ser Ser Glu Asp Ile Ser Asp Arg Leu Ala Gly Val Ser Val Gly		
915	920	925
Leu Pro Ser Ser Thr Thr Glu Gln Pro Lys Pro Ala Val Gln Thr		
930	935	940
Lys Gly Arg Pro His Ser Gln Cys Leu Asn Ser Ser Pro Leu Ser His		
945	950	955
960		
Ala Gln Leu Met Phe Pro Ala Pro Ser Ala Pro Cys Ser Ser Ala Pro		
965	970	975
Ser Val Pro Asp Ile Ser Lys His Arg Pro Gln Ala Phe Val Pro Cys		
980	985	990
Lys Ile Pro Ser Ala Ser Pro Gln Thr Gln Arg Lys Phe Ser Leu Gln		
995	1000	1005
Phe Gln Arg Asn Cys Ser Glu His Arg Asp Ser Asp Gln Leu Ser		
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Pro Val Phe Thr Gln Ser Arg Pro Pro Pro Ser Ser Asn Ile His		
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Arg Pro Lys Pro Ser Arg Pro Val Pro Gly Ser Thr Ser Lys Leu		
1040	1045	1050
Gly Asp Ala Thr Lys Ser Ser Met Thr Leu Asp Leu Gly Ser Ala		
1055	1060	1065
Ser Arg Cys Asp Asp Ser Phe Gly Gly Gly Asn Ser Gly Asn		
1070	1075	1080

Ala Val Ile Pro Ser Asp Glu Thr Val Phe Thr Pro Val Glu Asp  
 1085 1090 1095  
 Lys Cys Arg Leu Asp Val Asn Thr Glu Leu Asn Ser Ser Ile Glu  
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 Asp Leu Leu Glu Ala Ser Met Pro Ser Ser Asp Thr Thr Val Thr  
 1115 1120 1125  
 Phe Lys Ser Glu Val Ala Val Leu Ser Pro Glu Lys Ala Glu Asn  
 1130 1135 1140  
 Asp Asp Thr Tyr Lys Asp Asp Val Asn His Asn Gln Lys Cys Lys  
 1145 1150 1155  
 Glu Lys Met Glu Ala Glu Glu Glu Glu Ala Leu Ala Ile Ala Met  
 1160 1165 1170  
 Ala Met Ser Ala Ser Gln Asp Ala Leu Pro Ile Val Pro Gln Leu  
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 Gln Val Glu Asn Gly Glu Asp Ile Ile Ile Ile Gln Gln Asp Thr  
 1190 1195 1200  
 Pro Glu Thr Leu Pro Gly His Thr Lys Ala Lys Gln Pro Tyr Arg  
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 Glu Asp Ala Glu Trp Leu Lys Gly Gln Gln Ile Gly Leu Gly Ala  
 1220 1225 1230  
 Phe Ser Ser Cys Tyr Gln Ala Gln Asp Val Gly Thr Gly Thr Leu  
 1235 1240 1245  
 Met Ala Val Lys Gln Val Thr Tyr Val Arg Asn Thr Ser Ser Glu  
 1250 1255 1260  
 Gln Glu Glu Val Val Glu Ala Leu Arg Glu Glu Ile Arg Met Met  
 1265 1270 1275  
 Gly His Leu Asn His Pro Asn Ile Ile Arg Met Leu Gly Ala Thr  
 1280 1285 1290  
 Cys Glu Lys Ser Asn Tyr Asn Leu Phe Ile Glu Trp Met Ala Gly  
 1295 1300 1305  
 Gly Ser Val Ala His Leu Leu Ser Lys Tyr Gly Ala Phe Lys Glu  
 1310 1315 1320  
 Ser Val Val Ile Asn Tyr Thr Glu Gln Leu Leu Arg Gly Leu Ser  
 1325 1330 1335  
 Tyr Leu His Glu Asn Gln Ile Ile His Arg Asp Val Lys Gly Ala  
 1340 1345 1350  
 Asn Leu Leu Ile Asp Ser Thr Gly Gln Arg Leu Arg Ile Ala Asp  
 1355 1360 1365  
 Phe Gly Ala Ala Ala Arg Leu Ala Ser Lys Gly Thr Gly Ala Gly

1370	1375	1380
Glu Phe Gln Gly Gln Leu	Leu Gly Thr Ile Ala Phe	Met Ala Pro
1385 1390		1395
Glu Val Leu Arg Gly Gln	Gln Tyr Gly Arg Ser Cys	Asp Val Trp
1400 1405		1410
Ser Val Gly Cys Ala Ile	Ile Glu Met Ala Cys Ala	Lys Pro Pro
1415 1420		1425
Trp Asn Ala Glu Lys His	Ser Asn His Leu Ala Leu	Ile Phe Lys
1430 1435		1440
Ile Ala Ser Ala Thr Thr Ala	Pro Ser Ile Pro Ser His	Leu Ser
1445 1450		1455
Pro Gly Leu Arg Asp Val Ala	Val Arg Cys Leu Glu	Leu Gln Pro
1460 1465		1470
Gln Asp Arg Pro Pro Ser Arg	Glu Leu Leu Lys His	Pro Val Phe
1475 1480		1485
Arg Thr Thr Trp		
1490		

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Ala Arg Ala Thr  
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Glu Asp Ile Ile Ile Ile Gln Gln Asp Thr Pro Glu Thr Leu Pro Gly  
20 25 30

His Thr Lys Ala Lys Gln Pro Tyr Arg Glu Asp Thr  
35 40